

ADDRESS

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RESEARCH INTERESTS

Strongly correlated quantum many-body systems, entanglement in many-body systems, ultracold atoms in optical lattices, topological quantum states, quantum gas microscopy, long-range interactions, degenerate Bose- and Fermi gases, transport in strongly correlated systems, Rydberg atoms, extended Hubbard models, few-particle systems, single-atom imaging, quantum magnetism

PROFESSIONAL EXPERIENCE

Since 08/2018 Assistant Professor, Department of Physics, University of Virginia

10/2015–08/2018 Associate Research Scholar at the Department of Physics, Princeton University
on a Dicke fellowship with Waseem Bakr

03/2015–09/2015 Postdoctoral Researcher at the Max-Planck Institute of Quantum Optics

EDUCATION

2010–2015 Ph.D. in Physics, summa cum laude (highest grade), Max-Planck Institute of Quantum Optics and Ludwig-Maximilians-Universität München, Germany (Prof. I. Bloch)

2007–2009 M.S. Physics, with distinction, Technical University of Darmstadt, Germany

2005–2010 B.S. Computer Science, Technical University of Darmstadt, Germany

2004–2007 B.S. Physics, Technical University of Darmstadt, Germany

ACADEMIC HONORS

2023 Sloan Research Fellow

2021 UVA Research Award

2021 NSF Career Award

2018 Blavatnik Family Foundation 2018 Regional Award Finalist

2015 – 2018 Dicke Fellowship at Princeton University

ACADEMIC HONORS FOR GROUP MEMBERS

2023	Jefferson Scholars Foundation Fellowship for Jirayu Mongkolkiattichai
2023	UVA Physics department Poster award, first price, Jirayu Mongkolkiattichai
2022	Steven Thornton Award in Physics Undergraduate Research for Davis Garwood
2021	Beitchman summer fellowship for Jirayu Mongkolkiattichai

PROFESSIONAL SERVICE

Referee for Nature, Science, Nat. Phys., Phys. Rev. Lett., Nat. Comm., New J. Phys., J. Phys. B, Quantum Sci. Technol., J. Phys.: Condens. Matter, Appl. Phys. B, Opt. Express, and others, IOP Trusted Reviewer

Reviewer for 2020 Huskey Graduate Research Exhibition at the University of Virginia

Panelist at UVA NSF CAREER Program Workshop 2022

Harrison & Double Hoo Award reviewer 2022

Member of organization team of The Annual National Physics Show of the UVA department of physics 2022, 2023

SCIENTIFIC ACHIEVEMENTS

- First single-site imaging of Rydberg atoms in a quantum gas microscope
- First in-situ imaging of Rydberg crystals
- Realization of transverse Ising models with Rydberg atoms in optical lattices
- Adiabatic preparation of Rydberg crystals in one and two dimensions
- Direct measurement of the spatial Rydberg-Rydberg correlation function
- Spatially resolved imaging of entangled Rydberg superatoms
- First excitation of lithium Rydberg atoms in an optical lattice using 230nm light
- Experimental implementation of Raman sideband cooling for ^6Li in a novel optical lattice
- Observation of canted antiferromagnetism of fermions in optical lattices
- Observation of charge density waves of attractive fermions in optical lattices
- Preparation of Ising Rydberg-antiferromagnets in optical lattices
- Observation of bad metallic transport in Hubbard systems
- First quantum gas microscopy of fermionic Mott insulators in a triangular lattice

INVITED TALKS AND SEMINARS

42. Invited talk, Harvard ITAMP workshop "Quantum Simulation of the doped Hubbard model", Cambridge, MA, November 14-16, 2022
41. Invited talk, Dicke Symposium, "Quantum gas microscopy of triangular-lattice Mott insulators", Princeton, NJ, September 29, 2022
40. Invited talk, DAMOP 2022, Orlando, FL, June 3, 2022, "Quantum gas microscopy of triangular lattice Mott insulators"
39. Invited talk, Workshop on Non-equilibrium Dynamics and Exotic Phases in Quantum Gases, Beijing, July 3, 2021, "A triangular-lattice Fermi gas microscope" (virtual)
38. Seminar, University of California, Berkeley, June 29, 2021, "A triangular-lattice Fermi gas microscope"
37. Group seminar Bloch, Garching, Germany, June 15, 2021, "A triangular-lattice Fermi gas microscope" (virtual)
36. Quantech Group Seminar, Universidade Federal do Rio Grande de Norte, Natal, Brazil, June 3, 2021, "A triangular-lattice Fermi gas microscope" (virtual)
35. Condensed Matter Seminar, George Mason University, April 12, 2021, "A triangular-lattice Fermi gas microscope" (virtual)
34. ITAMP Harvard, Zoom seminar, October 15, 2020, "Quantum gas microscopy of strongly correlated fermions in optical lattices - From strange metals to spin liquids" (virtual)
33. Invited talk, SESAPS 2019, Wrightsville Beach, NC, November 7, "Probing dynamical properties of Fermi-Hubbard systems with a quantum gas microscope"
32. Invited talk, SESAPS 2019, Wrightsville Beach, NC, November 7, "Probing the quench dynamics of antiferromagnetic correlations in a 2D quantum Ising system of 200 spins"
31. Invited talk, Paris Edge 2019, Paris, September 26, 2019, "Probing dynamical properties of Fermi-Hubbard systems with a quantum gas microscope"
30. Seminar, Institute d'optique, Palaiseau, France, September 23, 2019, "Probing dynamical properties of Fermi-Hubbard systems with a quantum gas microscope"
29. Invited talk, 2019 Blavatnik Science Symposium, NYAS, New York, July 15, 2019, "Quantum gas microscopy of ultracold fermionic atoms"
28. Seminar, Virginia Tech, Blacksburg, April 22, 2019, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"
27. Condensed Matter Seminar, University of Virginia, Charlottesville, March 28, 2019, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"
26. Invited talk, Aspen Winter Conference 2019: New Approaches to Strongly Correlated Quantum Systems, Aspen, USA, February 5, 2019, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"
25. Invited talk, Advances in Quantum Simulation with Ultracold Atoms, Natal, Brazil, November 9, 2018, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"

24. Invited talk, Bounding Transport and Chaos in Condensed Matter and Holography, Nordita, Stockholm, Sweden, September 9, 2018, "Bad Metallic Transport in a Cold Atom Fermi-Hubbard System"
23. Thomas F. Gallagher Retirement Symposium, University of Virginia, Charlottesville, VA, August 24, 2018, "Quantum simulation of transverse Ising models with Rydberg atoms in optical lattices"
22. Invited talk, Quantum transport with cold atoms conference, Congressi Stefano Franscini, Monte Verità, TI, Switzerland, July 21-25, 2018, "Bad Metallic Transport in a Cold Atom Fermi-Hubbard System"
21. Seminar, ZOQ, Hamburg, Germany, July 11, 2018, "Bad Metallic Transport in a Cold Atom Fermi-Hubbard System"
20. Seminar, ICFO, Barcelona, Spain, July 4, 2018, "Probing the quench dynamics of antiferromagnetic correlations in a 2D quantum Ising spin system"
19. IAP Colloquium, TU Darmstadt, Germany, April 10, 2018, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"
18. JFI Special seminar, University of Chicago, IL, March 12, 2018, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"
17. Colloquium, University of Virginia, March 2, 2018, "Quantum gas microscopy of many-body dynamics in Fermi-Hubbard and Ising systems"
16. Invited talk, Croucher Conference in Frontiers of Cold Atom Physics, Hong Kong, December 5-8, 2017, "Microscopy of Fermi-Hubbard and transverse Ising systems"
15. Invited talk, Brazilian Physical Society Meeting 2017 XL ENFMC, Armação dos Búzios, RJ, Brazil, August 28, 2017, "Microscopy of atomic Fermi-Hubbard systems in new regimes"
14. JILA Public Seminar, Boulder, CO, August 22, 2017, "Microscopy of atomic Fermi-Hubbard systems in new regimes"
13. Group seminar Pfau, Stuttgart, Germany, July 13, 2017, "Microscopy of atomic Fermi-Hubbard systems in new regimes"
12. Condensed Matter Physics seminar, Caltech, Pasadena, CA, June 19, 2017, "Microscopy of atomic Fermi-Hubbard systems in new regimes"
11. Invited talk, Focus Workshop on Long-range interactions with ultracold atoms, Natal, RN, Brazil, November 21, 2016, "Long-range Ising quantum magnets with Rydberg atoms"
10. Invited talk, Workshop on Topological Effects In Ultra-Cold Atoms, Natal, RN, Brazil, November 15, 2016, "Spin-imbalanced Fermi gases with and without lattice in two dimensions"
9. Invited talk, DAMOP 2016, Providence, RI, May 23-27, 2016, "Crystallization in Ising quantum magnets and Rydberg superatoms"
8. Group seminar Bloch, Garching, Germany, April 12, 2016, "Phase separation and pair condensation in a spin-imbalanced 2D Fermi gas"
7. Group seminar Kuhr, Glasgow, UK, July 7, 2015, "Transport in Heisenberg spin chains"
6. Group seminar Rempe, Garching, Germany, June 11, 2015, "High-resolution imaging of Rydberg many-body systems"

5. Invited talk, Workshop - Networks of Ultra-Cold Rydberg atoms - Keble College, Oxford, UK, January 9-10, 2014, "Spatially ordered structures and coherent control in a two-dimensional Rydberg gas"
4. Theory Seminar, MPI of Quantum Optics, Garching, Germany, December 18, 2013, "Spatially ordered structures and coherent control in a two-dimensional Rydberg gas"
3. MPQ-Colloquium, MPI of Quantum Optics, Garching, Germany, December 3, 2013, "Spatially ordered structures and coherent control in a two-dimensional Rydberg gas"
2. Invited talk, Long-range interactions in the ultracold, Satellite workshop of Sant-Feliu BEC 2013, Stuttgart, Germany, September 3-5, 2013, "Spatially ordered structures in a two-dimensional Rydberg gas"
1. Invited talk, RQI – Winter School on Rydberg Physics and Quantum Information 2013, Obergurgl, Austria, February 10-15, 2013, "Observation of mesoscopic crystalline structures in a two-dimensional Rydberg gas"

SELECTED CONTRIBUTED TALKS

- Conference on Frontiers in Two-Dimensional Quantum Systems, Trieste, Italy, November 14, 2017, "Microscopy of two-dimensional atomic Fermi-Hubbard systems in new regimes"
- EGAS49, Durham, UK, July 18, 2017, "Quantum gas microscopy of spatial correlations in attractive and repulsive Fermi-Hubbard systems"
- International Workshop on Many-body physics in synthetic quantum systems, Stellenbosch, South Africa, April 7, 2016, "Demonstration of Rydberg dressing in a many body system"
- 2013 Joint Meeting of the APS Division of Atomic, Molecular & Optical Physics and the CAP Division of Atomic, Molecular & Optical Physics, Québec City, Canada, June 5, 2013, "Observation of spatially ordered structures in a two-dimensional Rydberg gas"

PROJECTS AND THEORY COLLABORATIONS

- Ytterbium in cryogenic optical tweezers for precision measurements and quantum computing (ongoing)
In the lab at the University of Virginia. Experiment construction started. Theory collaboration with Israel Klich.
- Numerical Linked Cluster expansion of spin models (ongoing)
Theory collaboration with Gia-Wei Chern and Davis Garwood.
- Triangular lattice Fermi gas microscope (ongoing)
In the lab at the University of Virginia. Theory collaboration with Tommaso Macri, Gia-Wei Chern, and others.
- Toward superfluid helium droplets on a structured cesium surface (ongoing)
Collaboration with Bellave Shivaram (Physics) and Kevin Lehmann (Chemistry)
- Quantum wakes
In collaboration with Israel Klich.
- Dipolar interacting fermions using Rydberg dressing
In collaboration with Waseem Bakr in Princeton.

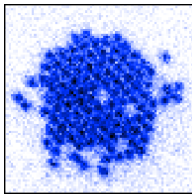
- Transport in the 2D Fermi-Hubbard model
In the group of Waseem Bakr in collaboration with David Huse.
- Dynamics in a 2D Ising model with Rydberg atoms in an optical lattice
In the group of Waseem Bakr in collaboration with Trithep Devakul and David Huse.
- Spin correlations in the Fermi-Hubbard model
In the group of Waseem Bakr in collaboration with Ehsan Khatami, Thereza Paiva, Nandini Trivedi and David Huse.
- Many-body localization in the 2D Bose-Hubbard model
In the group of Immanuel Bloch and Christian Gross. In collaboration with Vedika Khemani and David Huse.
- Rydberg atoms in optical lattices
In the group of Immanuel Bloch, Stefan Kuhr, Christian Gross. In collaboration with Thomas Pohl, Tommaso Macrì and Rick van Bijnen.
- Dynamics, excitations and correlations in the Bose-Hubbard model
In the group of Immanuel Bloch, Stefan Kuhr, Christian Gross. In collaboration with Mari Carmen Bañuls, Peter Barmettler, Eugene Demler, Thierry Giamarchi, Michael Knap, Corinna Kollath, Leonardo Mazza, David Pekker, Dario Poletti, Lode Pollet, Ulrich Schollwöck.
- Atoms in optical microtraps
In the group of Gerhard Birkel.

PUBLICATIONS

Google scholar: h-index 23, # of citations > 7,500
 ISI WoS: h-index 22, # of citations > 4,600
 Preprints of publications are available on arxiv.org.
 25 publications, 10 in Nature/Science, 10 in Phys. Rev. Lett./Nature Physics/PRX

Preprints

1.



J. Mongkolkeha, L. Liu, D. Garwood, J. Yang, **P. Schauss**
Quantum gas microscopy of a geometrically frustrated Hubbard system
 arXiv:2210.14895 (2022)
 → First fermionic Mott insulator in a triangular lattice
 → First spin-spin correlations in a frustrated lattice

Popular articles

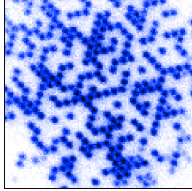
1. **P. Schauss**
Polarons leave a trace (Perspective)
 Science **365**, 218 (2019)

Peer-reviewed publications

26. D. Garwood, J. Mongkolkeha, L. Liu, J. Yang, **P. Schauss**
Site-resolved observables in the doped spin-imbalanced triangular Hubbard model
 Phys. Rev. A 106, 013310 (2022)

25. D. Garwood, L. Liu, J. Mongkolkiattichai, J. Yang, **P. Schauss**
A hybrid Zeeman slower for lithium
 Rev. Sci. Instrum. **93**, 033202 (2022)

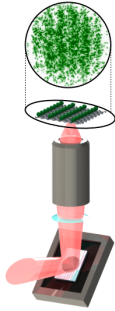
24.



J. Yang, L. Liu, J. Mongkolkiattichai, **P. Schauss**
Site-resolved imaging of ultracold fermions in a triangular-lattice quantum gas microscope
 PRX Quantum **2**, 020344 (2021)
 → First single-site imaging of fermions in a triangular lattice
 → First quantum gas microscope with three different 2d lattices
 Citations (ISI Web of Science): 19, (Google scholar): 44

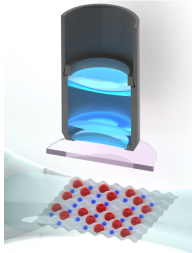
23. M. Wampler, **P. Schauss**, E. B. Kolomeisky, I. Klich
Quantum wakes in lattice fermions
 Phys. Rev. Research **3**, 033112 (2021)
22. E. Guardado-Sanchez, B. M. Spar, **P. Schauss**, R. Belyansky, J. T. Young, P. Bienias, A. V. Gorshkov, T. Iadecola, W. S. Bakr
Quench Dynamics of a Fermi Gas with Strong Nonlocal Interactions
 Phys. Rev. X **11**, 021036 (2021)

21.



P. T. Brown, D. Mitra, E. Guardado-Sanchez, R. Nourafkan, A. Reymbaut, C.-D. Hébert, S. Bergeron, A.-M. S. Tremblay, J. Kokalj, D. A. Huse, **P. Schauf**, W. S. Bakr
Bad metallic transport in a cold atom Fermi-Hubbard system
 Science **363**, 379–382 (2019)
 → Observation of bad metallic transport in Hubbard systems
 → First precision diffusion measurement with ultracold fermions
 Citations (ISI Web of Science): 142, (Google scholar): 197

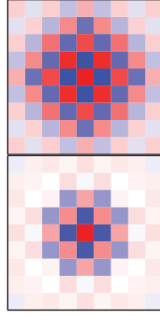
20.



E. Guardado-Sanchez, P. T. Brown, D. Mitra, T. Devakul, D. A. Huse, **P. Schauf**, W. S. Bakr
Probing the quench dynamics of antiferromagnetic correlations in a 2D quantum Ising spin system
 Phys. Rev. X **8**, 021069 (2018)
 → Preparation of 2D Ising Rydberg-antiferromagnets
 → First excitation of lithium Rydberg atoms in an optical lattice
 Citations (ISI Web of Science): 117, (Google scholar): 160

19. **P. Schauss**
Quantum simulation of transverse Ising models with Rydberg atoms
 Quantum Sci. Technol. **3**, 023001 (2018)
18. D. Mitra, P. T. Brown, E. Guardado-Sanchez, S. S. Kondov, T. Devakul, D. A. Huse, **P. Schauf**, W. S. Bakr
Quantum gas microscopy of an attractive Fermi-Hubbard system
 Nat. Phys., **14**, 173–177 (2018)

17.



P. T. Brown, D. Mitra, E. Guardado-Sanchez, **P. Schauß**,
S. S. Kondov, E. Khatami, T. Paiva, N. Trivedi, D. A. Huse, W. S. Bakr
Spin-imbalance in a 2D Fermi-Hubbard system

Science **357**, 1385–1388 (2017)

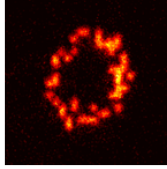
→ First observation anisotropic correlations in cold-atom Hubbard system

→ Raman sideband cooling for ^6Li in a novel optical lattice

Citations (ISI Web of Science): 100, (Google scholar): 148

16. D. Mitra, P. Brown, **P. Schauß**, S. S. Kondov, W. S. Bakr
Phase Separation and Pair Condensation in a Spin-Imbalanced 2D Fermi Gas
Phys. Rev. Lett. **117**, 093601 (2016)

15.



J. Zeiher, R. van Bijnen, **P. Schauß**, S. Hild, J.-y. Choi, T. Pohl, I. Bloch, C. Gross

Many-body interferometry of a Rydberg-dressed spin lattice

Nat. Phys. **12**, 1095–1099 (2016)

→ First coherent Rydberg dressing in a many-body system

Citations (ISI Web of Science): 219, (Google scholar): 303

14.



J.-y. Choi, S. Hild, J. Zeiher, **P. Schauß**, A. Rubio-Abadal, T. Yefsah, V. Khemani, D. A. Huse, I. Bloch, C. Gross

Exploring the many-body localization transition in two dimensions

Science **352**, 1547–1552 (2016)

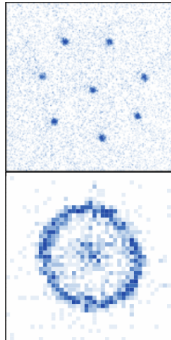
→ Observation of many-body localization with interacting bosons in 2D

Citations (ISI Web of Science): 539, (Google scholar): 834

13. J. Zeiher, **P. Schauß**, S. Hild, T. Macrì, I. Bloch, C. Gross
[OA] *Microscopic Characterization of Scalable Coherent Rydberg Superatoms*
Phys. Rev. X **5**, 031015 (2015)

12. T. Fukuhara, S. Hild, J. Zeiher, **P. Schauß**, I. Bloch, M. Endres, C. Gross
Spatially Resolved Detection of a Spin-Entanglement Wave in a Bose-Hubbard Chain
Phys. Rev. Lett. **115**, 035302 (2015)

11.



P. Schauß, J. Zeiher, T. Fukuhara, S. Hild, M. Cheneau, T. Macrì, T. Pohl, I. Bloch, C. Gross

Crystallization in Ising quantum magnets

Science **347**, 1455–1458 (2015)

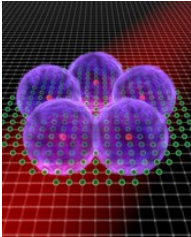
→ First in-situ imaging of Rydberg crystals in 1D and 2D

→ First adiabatic preparation in Rydberg Ising system

→ Onset of shell formation

Citations (ISI Web of Science): 207, (Google scholar): 310

10. S. Hild, T. Fukuhara, **P. Schauß**, J. Zeiher, M. Knap, E. Demler, I. Bloch, C. Gross
Far-from-Equilibrium Spin Transport in Heisenberg Quantum Magnets
Phys. Rev. Lett. **113**, 147205 (2014)

9. T. Fukuhara, **P. Schauß**, M. Endres, S. Hild, M. Cheneau, I. Bloch, C. Gross
Microscopic observation of magnon bound states and their dynamics
Nature **502**, 76–79 (2013)
8. T. Fukuhara, A. Kantian, M. Endres, M. Cheneau, **P. Schauß**, S. Hild,
D. Bellem, U. Schollwöck, T. Giamarchi, C. Gross, I. Bloch, S. Kuhr
Quantum dynamics of a mobile spin impurity
Nat. Phys. **9**, 235–241 (2013)
7. M. Endres, M. Cheneau, T. Fukuhara, C. Weitenberg, **P. Schauß**, C. Gross,
L. Mazza, M. C. Bañuls, L. and Pollet, I. Bloch, S. Kuhr
Single-site- and single-atom-resolved measurement of correlation functions
Appl. Phys. B **113**, 27–39 (2013)
6.  **P. Schauß**, M. Cheneau, M. Endres, T. Fukuhara, S. Hild,
A. Omran, T. Pohl, C. Gross, S. Kuhr, I. Bloch
Observation of spatially ordered structures in a two-dimensional Rydberg gas
Nature **491**, 87–91 (2012)
→ First imaging of Rydberg atoms in a quantum gas microscope
→ First in-situ observation of Rydberg ordering
Citations (ISI Web of Science): 390, (Google scholar): 603
5. M. Endres, T. Fukuhara, D. Pekker, M. Cheneau, **P. Schauß**, C. Gross, E. Demler, S.
Kuhr, I. Bloch
The 'Higgs' amplitude mode at the two-dimensional superfluid/Mott insulator transition
Nature **487**, 454–458 (2012)
4. M. Cheneau, P. Barmettler, D. Poletti, M. Endres, **P. Schauß**,
T. Fukuhara, C. Gross, I. Bloch, C. Kollath, S. Kuhr
Light-cone-like spreading of correlations in a quantum many-body system
Nature **481**, 484–487 (2012)
3. M. Endres, M. Cheneau, T. Fukuhara, C. Weitenberg, **P. Schauß**, C. Gross,
L. Mazza, M. C. Bañuls, L. Pollet, I. Bloch, S. Kuhr
*Observation of correlated particle-hole pairs and string order in low-dimensional Mott
insulators*
Science **334**, 200–203 (2011)
2. C. Weitenberg, **P. Schauß**, T. Fukuhara, M. Cheneau, M. Endres, I. Bloch, S. Kuhr
Coherent Light Scattering from a Two-Dimensional Mott Insulator
Phys. Rev. Lett. **106**, 215301 (2011) [Selected for a PRL 'Viewpoint']
1. C. Weitenberg, M. Endres, J. F. Sherson, M. Cheneau, **P. Schauß**, T. Fukuhara, I. Bloch,
S. Kuhr
Single-spin addressing in an atomic Mott insulator
Nature **471**, 319–324 (2011)